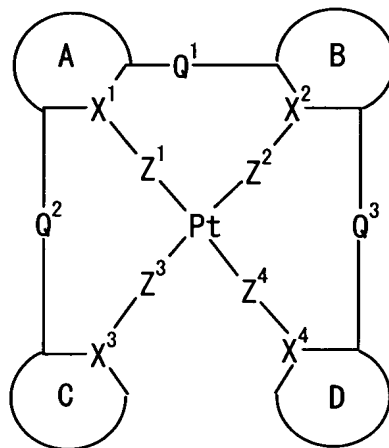


Claims

[1] A platinum complex represented by the following general formula (1):



(1)

(wherein two rings of ring A, ring B, ring C, and ring D represent nitrogen-containing heterocyclic rings which may have substituent(s) and the remaining two rings of them represent aryl rings or hetero aryl rings which may have substituent(s), the ring A and the ring B, or/and the ring A and the ring C, or/and the ring B and the ring D may form condensed rings, and each of the rings and R¹, R², R³, R⁴ or R⁵ described later may form a condensed ring; two of X¹, X², X³, and X⁴ represent nitrogen atoms coordination bonded to a platinum atom and the remaining two of them represent carbon atoms or nitrogen atoms. Q¹, Q², and Q³ each

represent independently a bivalent atom (group) or single bond providing that Q^1 , Q^2 , and Q^3 do not represent single bond simultaneously, and two of Z^1 , Z^2 , Z^3 , and Z^4 represent coordination bonds, and the remaining two of them represent
5 covalent bonds, oxygen atoms or sulfur atoms).

[2] A platinum complex according to claim 1, wherein, in the general formula (1), a bivalent atom (group) represented by each of Q^1 , Q^2 , and Q^3 is $-(CR^1R^2)_{n1}-$, $-O(CR^1R^2)_{n1}O-$, $-(O)_{n2}C(=O)(O)_{n3}-$, oxygen atom, sulfur atom, $-NR^3-$, $-BR^{3a}-$, $-S(=O)-$, $-SO_2-$, $-O(SO_2)O-$, $-Si(R^4R^5)-$, $-OSi(R^4R^5)O-$, or $-C(=CR^aR^b)-$, (where R^1 and R^2 each represent independently hydrogen atom, alkyl group, aralkyl group, aryl group, or alkoxy group; $n1$ represents an integer of 1
10 to 3, and $n2$ and $n3$ each represent independently an integer of 0 or 1; R^3 represents hydrogen atom, alkyl group, aralkyl group, or aryl group, R^{3a} represents alkyl group, aralkyl group, or aryl group; R^4 and R^5 each represent independently alkyl group, aralkyl group or aryl group; R^a
15 and R^b each represent independently hydrogen atom, alkyl group, aralkyl group, aryl group, or cyano group; and R^1 and R^2 , R^4 and R^5 , or R^a and R^b may join to each other to form a ring which may contain a hetero atom in the ring together with the atom substituted with each of them).

[3] A platinum complex according to claim 1 or 2, wherein two rings of the ring A, ring B, ring C and ring D of the compound represented by the general formula (1) are 5-membered or 6-membered nitrogen-containing heterocyclic rings which may have a substituent, and one or two 5- or 6-membered aromatic hydrocarbon ring or aromatic heterocyclic ring may be condensed to said ring to form condensed rings.

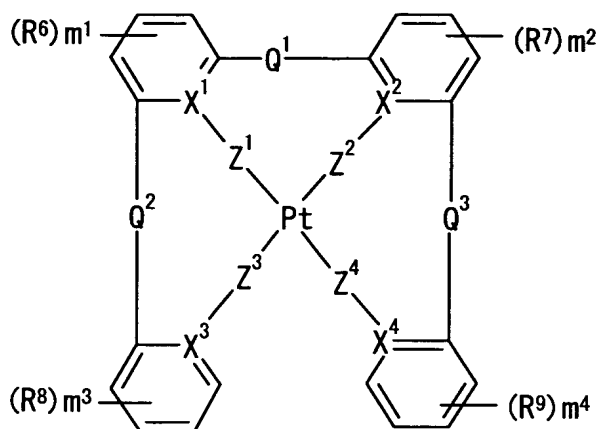
[4] A platinum complex according to any one of claims 1 to 3, wherein two of the rings of the ring A, ring B, ring C, and the ring D of the compound represented by the general formula (1) are nitrogen-containing heterocyclic rings which may have substituent(s) selected from the group consisting of pyridine ring, diazine ring, triazine ring, pyrrole ring, diazole ring, triazole ring, thiazole ring, thiadiazole ring, oxazole ring, oxadiazole ring, benzopyridine ring, benzothiazine ring, and benzopyrrole group which may have substituent(s) respectively.

[5] A platinum complex according to any one of claims 1 to 4, wherein two rings of the ring A, ring B, ring C, and ring D of the compound represented by the general formula (1) are nitrogen-containing heterocyclic rings which may have substituent(s) and the remaining two rings are 6-membered aromatic hydrocarbon rings or aromatic

heterocyclic rings, or 5-membered aromatic heterocyclic rings which may have substituent(s), which are aryl rings or heteroaryl rings where one or two 5- or 6-membered aromatic hydrocarbon rings or aromatic heterocyclic rings
5 may be condensed to said rings to form condensed rings.

[6] A platinum complex according to any one of claims 1 to 5, wherein two rings of the ring A, ring B, ring C, and ring D of the compound represented by the general formula
10 (1) are nitrogen-containing heterocyclic rings which may have substituent(s) and the remaining two rings are aryl rings or heteroaryl rings which may have substituent(s), selected from benzene ring, pyridine ring, diazine ring, triazine ring, pyrrole ring, diazole ring, furan ring,
15 thiophene ring, oxazole ring, and thiazole ring which may have a substituent respectively, or condensed rings where one or two 5- or 6-membered aromatic hydrocarbon rings or aromatic heterocyclic rings are condensed to said rings.

20 [7] A platinum complex according to claim 1 represented by the following general formula (2):



(2)

(wherein R⁶, R⁷, R⁸, and R⁹ each represent independently
 alkyl group, halogenated alkyl group, aralkyl group,
 5 alkenyl group, alkynyl group, aryl group, amino group,
 mono- or di-alkyl amino group, mono or di-aralkyl amino
 group, mono- or di-aryl amino group, alkoxy group,
 alkenyloxy group, aralkyloxy group, aryloxy group,
 heteroaryloxy group, acyl group, alkoxycarbonyl group,
 10 aryloxycarbonyl group, acyloxy group, acylamino group,
 alkoxycarbonylamino group, aryloxycarbonylamino group,
 aralkyloxycarbonylamino group, sulfonylamino group,
 sulfamoyl group, carbamoyl group, alkylthio group,
 aralkylthio group, arylthio group, heteroarylthio group,
 15 alkanesulfonyl group, arenesulfonyl group, alkanesulfinyl
 group, arenesulfinyl group, ureido group, substituted
 phosphoramidate group, hydroxyl group, mercapto group,
 halogen atom, cyano group, sulfo group, carboxyl group,
 nitro group, hydroxamic acid group, sulfinio group,

hydrazino group, heterocyclic group, trialkylsilyl group or
 triarylsilyl group, and R^6 and R^7 , R^6 and R^8 or/and R^7 and R^9
 may form condensed rings; m^1 , m^2 , m^3 , and m^4 each represent
 the number of R^6 , R^7 , R^8 , and R^9 and independently represent
 5 an integer of 0 to 3; in a case where each of m^1 , m^2 , m^3 ,
 and m^4 is an integer of 2 or greater, plural R^6 , R^7 , R^8 , and
 R^9 may be different from each other and further, a group of
 R^6 , a group of R^7 , a group of R^8 , and a group of R^9 may join
 to each other to form a condensed ring structure; Q^1 , Q^2 ,
 10 and Q^3 each represent independently $-(CR^1R^2)_{n1}-$, $-O(CR^1R^2)_{n1}O-$,
 $-(O)_{n2}C(=O)(O)_{n3}-$, oxygen atom, sulfur atom, $-NR^3-$, $-BR^{3a}-$, $-$
 $S(=O)-$, $-SO_2-$, $-O(SO_2)O-$, $-Si(R^4R^5)-$, $-OSi(R^4R^5)O-$, $-$
 $C(=CR^aR^b)-$, or a single bond providing that Q^1 , Q^2 , and Q^3
 do not represent single bond simultaneously; R^1 and R^2 in Q^1 ,
 15 Q^2 , and Q^3 each represent independently hydrogen atom,
 alkyl group, aralkyl group, aryl group, or alkoxy group; $n1$
 represents an integer of 1 to 3 and $n2$ and $n3$ each
 represent independently an integer of 0 or 1; R^3 represents
 hydrogen atom, alkyl group, aralkyl group, or aryl group,
 20 and R^{3a} represents alkyl group, aralkyl group or aryl
 group; R^4 and R^5 each represent independently alkyl group,
 aralkyl group or aryl group; R^a and R^b each represent
 independently hydrogen atom, alkyl group, aralkyl group,
 aryl group, or cyano group; R^1 and R^2 , R^4 and R^5 , or R^a and
 25 R^b may join to each other to form a ring which may contain

a hetero atom in the ring together with atoms substituted with each of them; two of X^1 , X^2 , X^3 , and X^4 represent nitrogen atoms coordination bonded to the platinum atom and the remaining two of them represent carbon atoms: and two
5 of Z^1 , Z^2 , Z^3 , and Z^4 represent coordination bonds, and the remaining two of them represent covalent bonds, oxygen atoms or sulfur atoms).

[8] A light-emitting device in which a light-emitting
10 layer or plural thin organic compound layers containing a light-emitting layer are formed between a pair of electrodes, in which at least one layer is a layer containing at least one kind of platinum complexes represented by the general formula (1) or the general
15 formula (2).

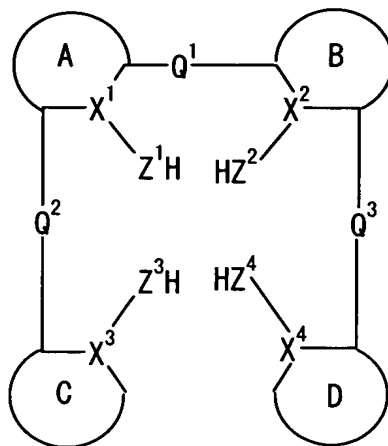
[9] A light-emitting device according to claim 8, wherein the light-emitting device is an organic electroluminescence device.

20

[10] A light-emitting device according to claim 8 or 9, wherein the platinum complex contained in at least one layer may function as a doping material in the light-emitting layer of the organic electroluminescence device.

25

[11] A compound represented by the following general formula (3):



(3)

5 (wherein two rings of ring A, ring B, ring C, and ring D represent nitrogen-containing heterocyclic rings which may have substituent(s) and the remaining two rings of them represent aryl rings or hetero aryl rings which may have substituent(s), the ring A and the ring B, the ring A and
10 the ring C or/and the ring B and the ring D may form condensed ring, and each of the rings and Q^1 , Q^2 , and Q^3 to be described below may form a condensed ring (excluding the case where Q^1 , Q^2 , and Q^3 are oxygen atoms and sulfur atoms); two of X^1 , X^2 , X^3 , and X^4 represent nitrogen atoms
15 coordination bonded to a platinum atom and remaining two of them represent carbon atoms or nitrogen atoms. Q^1 , Q^2 , and Q^3 each represent independently a bivalent atom (group) or a single bond providing that Q^1 , Q^2 , and Q^3 do not represent single bond simultaneously; in a case where X^1 , X^2 , X^3 , and

X^4 are nitrogen atoms capable of coordination bond, Z^1H , Z^2H , Z^3H , and Z^4H bonded thereto are not present, in a case where X^1 , X^2 , X^3 , and X^4 are carbon atoms, Z^1 , Z^2 , Z^3 , and Z^4 bonded thereto represent covalent bonds, oxygen atoms or sulfur atoms and, in a case where X^1 , X^2 , X^3 , and X^4 are nitrogen atoms capable of covalent bond, Z^1 , Z^2 , Z^3 and Z^4 bonded thereto represent covalent bonds).

[12] A compound according to claim 11, wherein, in the general formula (3), the bivalent atom (group) represented by Q^1 , Q^2 , and Q^3 each represents independently $-(CR^1R^2)_{n1}-$, $-O(CR^1R^2)_{n1}O-$, $-(O)_{n2}C(=O)(O)_{n3}-$, oxygen atom, sulfur atom, $-NR^3-$, $-BR^{3a}-$, $-S(=O)-$, $-SO_2-$, $-O(SO_2)O-$, $-Si(R^4R^5)-$, $-OSi(R^4R^5)O-$, or $-C(=CR^aR^b)-$, (where R^1 and R^2 each represent independently hydrogen atom, alkyl group, aralkyl group, aryl group, or alkoxy group; $n1$ represents an integer of 1 to 3, and $n2$ and $n3$ each represent independently an integer of 0 or 1; R^3 represents hydrogen atom, alkyl group, aralkyl group, or aryl group, and R^{3a} represents alkyl group, aralkyl group or aryl group; R^4 and R^5 each represent independently alkyl group, aralkyl group, or aryl group; R^a and R^b each represent independently hydrogen atom, alkyl group, aralkyl group, aryl group, or cyano group; R^1 and R^2 , R^4 and R^5 , or R^a and R^b may join to each other to form a ring which may contain a hetero atom in the ring

together with atoms substituted with each of them).

[13] A compound according to claim 11 or 12, wherein two rings of the ring A, ring B, ring C and ring D of the compound represented by the general formula (3) are 5-membered or 6-membered nitrogen-containing heterocyclic rings which may have substituent(s), and one or two 5- or 6-membered aromatic hydrocarbon rings or aromatic heterocyclic rings may be condensed to said rings to form condensed rings.

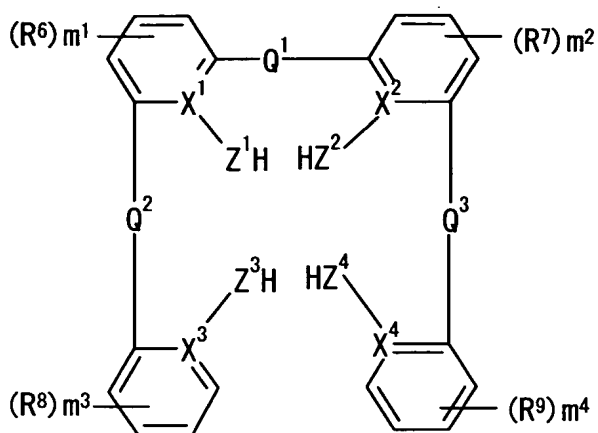
[14] A compound according to any one of claims 11 to 13, wherein two rings of the ring A, ring B, ring C, and the ring D of the compound represented by the general formula (3) are nitrogen-containing heterocyclic rings which may have substituent(s), selected from the group consisting of a pyridine ring, diazine ring, triazine ring, pyrrole ring, diazole ring, triazole ring, thiazole ring, thiadiazole ring, oxazole ring, oxadiazole ring, benzopyridine ring, benzothiazine ring, and benzopyrrole group which may have substituent(s) respectively.

[15] A compound according to any one of claims 11 to 14, wherein two rings of the ring A, ring B, ring C, and ring D of the compound represented by the general formula (3) are

nitrogen-containing heterocyclic rings which may have substituent(s) and the remaining two rings are 6-membered aromatic hydrocarbon rings or aromatic heterocyclic rings, or 5-membered aromatic heterocyclic rings which may have substituent(s), which are aryl rings or heteroaryl rings where one or two 5- or 6-membered aromatic hydrocarbon rings or aromatic heterocyclic rings may be condensed to said rings to form condensed rings.

10 [16] A compound according to any one of claims 11 to 15, wherein two rings of the ring A, ring B, ring C, and ring D of the compound represented by the general formula (3) are nitrogen-containing heterocyclic rings which may have substituent(s) and the remaining two rings are aryl rings
15 or heteroaryl rings which may have substituent(s), selected from benzene ring, pyridine ring, diazine ring, triazine ring, pyrrole ring, diazole ring, furan ring, thiophene ring, oxazole ring, and thiazole ring which may have substituent(s) respectively, or condensed rings where one
20 or two 5- or 6-membered aromatic hydrocarbon rings or aromatic heterocyclic rings are condensed to said rings.

[17] A compound according to claim 10 represented by the following general formula (4):



(4)

(wherein R^6 , R^7 , R^8 , and R^9 each represent independently alkyl group, halogenated alkyl group, aralkyl group, alkenyl group, alkynyl group, aryl group, amino group, mono- or di-alkyl amino group, mono- or di-aralkyl amino group, mono- or di-aryl amino group, alkoxy group, alkenyloxy group, aralkyloxy group, aryloxy group, heteroaryloxy group, acyl group, alkoxycarbonyl group, aryloxycarbonyl group, acyloxy group, acylamino group, alkoxycarbonylamino group, aryloxycarbonylamino group, aralkyloxycarbonylamino group, sulfonylamino group, sulfamoyl group, carbamoyl group, alkylthio group, aralkylthio group, arylthio group, heteroarylthio group, alkanesulfonyl group, arenesulfonyl group, alkanesulfinyl group, arenesulfinyl group, ureido group, substituted phosphoramidate group, hydroxyl group, mercapto group, halogen atom, cyano group, sulfo group, carboxyl group, nitro group, hydroxamic acid group, sulfinio group,

hydrazino group, heterocyclic group, trialkylsilyl group or
 triarylsilyl group, and R^6 and R^7 , R^6 and R^8 or/and R^7 and R^9
 may form condensed rings; m^1 , m^2 , m^3 , and m^4 each represent
 the number of R^6 , R^7 , R^8 , and R^9 and independently represent
 5 an integer of 0 to 3; in a case where each of m^1 , m^2 , m^3 ,
 and m^4 is an integer of 2 or greater, plural R^6 , R^7 , R^8 , and
 R^9 may be different from each other and further, a group of
 R^6 , a group of R^7 , a group of R^8 , and a group of R^9 may join
 to each other to form a condensed ring structure; Q^1 , Q^2 ,
 10 and Q^3 each represent independently $-(CR^1R^2)_{n1}-$, $-O(CR^1R^2)_{n1}O-$,
 $-(O)_{n2}C(=O)(O)_{n3}-$, oxygen atom, sulfur atom, $-NR^3-$, $-BR^{3a}-$,
 $S(=O)-$, $-SO_2-$, $-O(SO_2)O-$, $-Si(R^4R^5)-$, $-OSi(R^4R^5)O-$,
 $-C(=CR^aR^b)-$, or a single bond providing that Q^1 , Q^2 , and Q^3
 do not represent single bond simultaneously; R^1 and R^2 in Q^1 ,
 15 Q^2 , and Q^3 each represent independently hydrogen atom,
 alkyl group, aralkyl group, aryl group, or alkoxy group; $n1$
 represents an integer of 1 to 3 and $n2$ and $n3$ each
 represent independently an integer of 0 or 1; R^3 represents
 hydrogen atom, alkyl group, aralkyl group, or aryl group,
 20 and R^{3a} represents alkyl group, aralkyl group or aryl
 group; R^4 and R^5 each represent independently alkyl group,
 aralkyl group or aryl group; R^a and R^b each represent
 independently hydrogen atom, alkyl group, aralkyl group,
 aryl group, or cyano group; R^1 and R^2 , R^4 and R^5 , or R^a and
 25 R^b may join to each other to form a ring which may contain

a hetero atom in the ring together with atoms substituted with each of them; two of X^1 , X^2 , X^3 , and X^4 represent nitrogen atoms coordination bonded to the platinum atom and the remaining two of them represent carbon atoms; two of Z^1 ,
5 Z^2 , Z^3 , and Z^4 represent coordination bonds, and the remaining two of them represent covalent bonds, oxygen atoms or sulfur atoms; and H represents a hydrogen atom).